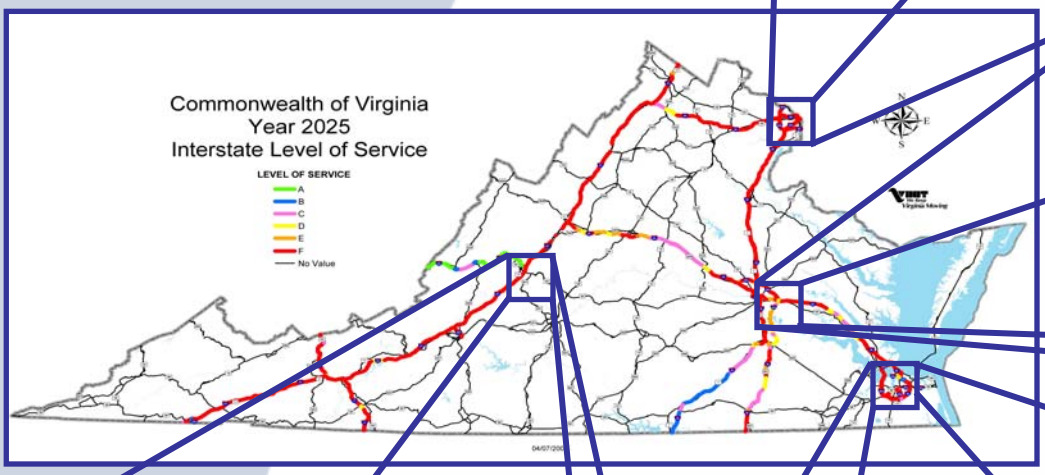
2025 STATE HIGHWAY PLAN

Technical Report



VDOT Virginia Department of Transportation

Transportation and Mobility Planning

2025 STATE HIGHWAY PLAN

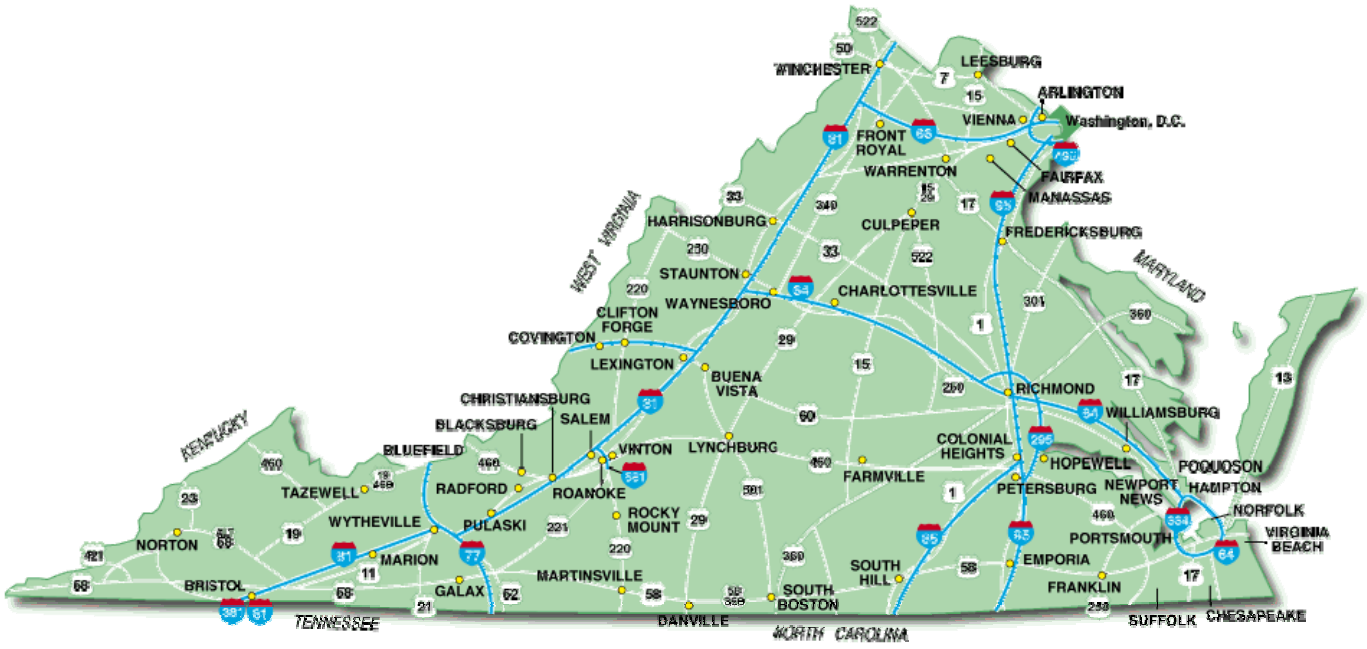
DECEMBER 2005

Prepared by
Transportation and Mobility Planning Division
Virginia Department of Transportation

In cooperation with the U.S. Department of Transportation
Federal Highway Administration

THE COMMONWEALTH OF VIRGINIA'S

Interstate and U.S. Primary Highway System



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Introduction

The Commonwealth of Virginia has the third largest state maintained highway system in the nation, behind North Carolina and Texas, with more than 1,100 center-line miles of interstate, 8,500 center-line miles of primary roads, more than 47,500 miles of secondary roads and more than 300 miles of service roads. Unlike the majority of states, Virginia maintains most public roads, with only Arlington and Henrico counties maintaining their own secondary roads. There are also more than 13,800 miles of urban streets outside of the state system that are maintained by cities and towns with funding assistance from the state. In total, there are over 70,000 miles of roads in Virginia which include more than 12,000 bridges, four underwater tunnels and two mountain tunnels.

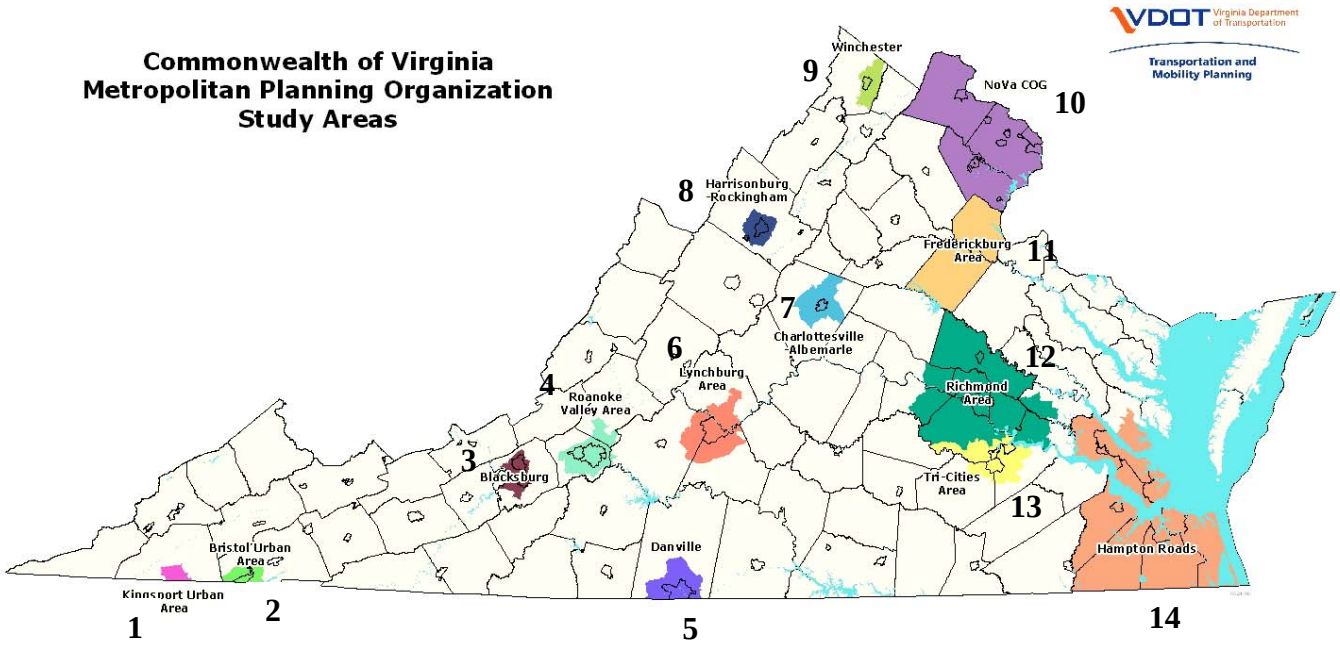
The 2025 State Highway Plan is the Virginia Department of Transportation's (VDOT) most recent coordinated transportation plan that identifies solutions for interstate and primary highway deficiencies on a statewide basis. In combination with the 2025 Highway Needs Assessment, it will assist decision makers in realizing the magnitude of state highway needs, establish a foundation for making necessary funding decisions, and provide a mechanism for the development of future highway projects. The State Highway Plan, combined with the 2025 Highway Needs Assessment and a prioritization process, establishes a technical, programmatic method for identifying and evaluating specific recommendations and ranking them by priority—providing an essential tool to those selecting projects for implementation. The State Highway Plan is a vision plan, and is not financially constrained. It is important to note that the State Highway Plan is not a construction plan, and inclusion of a recommendation in the plan does not represent a commitment to implementation. Finally, the State Highway Plan will serve as a key component to VTrans2025, Virginia's Statewide Long-Range Multimodal Transportation Plan.

A primary purpose of this report is to document the guidelines and processes that were used for the development of the 2025 State Highway Plan. The macroscopic scale of the 2025 State Highway Plan resulted in the modification of many of the traditional planning methods. For example, the traffic forecasting procedures used in the State Highway Plan are heavily dependent upon historic trends rather than the land use forecasting procedures and subsequent trip generation/ trip distribution/ traffic assignment processes associated with the traditional four step travel demand modeling typically used in urbanized areas. The four step process is used by the 14 urbanized areas (Figure 1) of the state where the continuous, comprehensive, and cooperative (3C) Metropolitan Planning Organization transportation planning processes are maintained. Additional detailed traffic forecasts that consider adjoining land uses include the small urban areas (Appendix A) where separate urban transportation studies are conducted, and roadway corridors where traffic studies have been conducted. In each of these cases, traffic forecasts are based on population, employment and land use projections. This plan will be evaluated continuously and updated at least every five years so that traffic trends can be closely monitored and any significant changes evaluated.

The scope of the State Highway Plan encompasses the interstate and primary highway systems that have been deemed transportation corridors of regional and statewide significance, and any transportation studies conducted on these systems. The 2025 State Highway Plan recommendations represent feasible solutions to capacity and geometric deficiencies, such as pavement widening, additional lanes, new roadway alignments, and interchange improvements.

Plan recommendations were developed using highway capacity analysis and field review by VDOT staff. The highway inventory and recommendations are grouped by VDOT construction district (see Appendix B), listed alphabetically by jurisdiction with counties listed first, then numerically by route number.

FIGURE 1. VIRGINIA'S METROPOLITAN PLANNING ORGANIZATIONS



1) Kingsport
2) Bristol
3) Blacksburg
4) Roanoke
5) Danville
6) Lynchburg
7) Charlottesville
8) Harrisonburg
9) Winchester
10) Northern Virginia
11) Fredericksburg
12) Richmond
13) Tri-Cities
14) Hampton Roads

Statewide Planning Process

In 2002, the Virginia General Assembly passed legislation that required the development of a statewide transportation plan, *VTrans2025,* that provided a comprehensive review of the statewide construction needs of all systems—highway, airports, seaports, transit, rail, bicycle and pedestrian. To accomplish the highway element (the 2025 State Highway Plan) of this mandate, VDOT used a statewide planning process comprised of three phases—an assessment phase, a plan development phase, and a prioritization phase. These phases are sequential in order, and build upon one another.

- **2025 Highway Needs Assessment (HNA)—**The Highway Needs Assessment identified system-wide highway performance deficiencies, without regard to financial constraints, to assist policy and decision makers in determining future transportation funding needs and allocations. The HNA used the Statewide Planning System (SPS) to analyze and evaluate highway system deficiencies. SPS used highway inventory information (e.g., pavement widths, number of lanes, terrain type) and traffic data (e.g., historical traffic counts, traffic projections) to identify existing and future highway system capacity deficiencies. The SPS systematically identified possible highway solutions to the deficiencies (e.g., increasing pavement width, adding more lanes) and used generalized planning cost estimates to provide costs for the solutions.

- **2025 State Highway Plan (SHP)**—Using the HNA as the foundation for identifying problem areas, planners developed the State Highway Plan. The 2025 State Highway Plan contains a list of financially unconstrained recommendations for the interstate and primary highway systems, reflecting recommendations from existing corridor studies, small urban area studies, Metropolitan Planning Organization (MPO) Constrained Long-Range Plans, and field reviews.

- **Highway Prioritization**—A concise set of goals, objectives, and measures was used to prioritize recommendations identified in the SHP. Prioritized recommendations will assist the Commonwealth Transportation Board (CTB) and VDOT in evaluating and programming transportation improvements in the Six-Year Improvement Program (SYIP).

Limited construction funds continue to make the planning of cost-effective highway improvements an important function. The SHP is used as the framework for developing short and long-range recommendations on the interstate and primary highway systems for possible inclusion in the SYIP. Recommendations to the secondary and urban highway systems are developed at the local level, where localities are primarily responsible for funding decisions on these systems.

Periodic reviews of the SHP are required, and the planning procedures refined and expanded upon. This plan is not a static document. It will be reviewed and updated as Virginia's transportation situation changes. Unanticipated changes in economic growth, life styles, business shipping practices, or technology could have an impact on future travel forecasts. Significantly different forecasts can impact recommendations on the highway system and affect

how transportation dollars are invested in future years. VDOT carefully monitors travel patterns, and revised travel forecasts will be reflected in future plan updates.

Goals and Objectives

In order to meet the mission of VDOT to provide safe, efficient, and effective ground transportation systems now and for the next twenty years, SHP goals and objectives have been established. These goals are based largely on the goals established by VTrans2025, Virginia's statewide long-range multimodal transportation plan, which were developed through an extensive public involvement process. The objectives for meeting these goals are those developed for the highway prioritization process and are tailored to specifically measure highway performance and function.

GOAL 1: ***Provide a transportation system that facilitates the efficient movement of people and goods.***

Objectives

- Reduce congestion
- Maximize benefits for the greatest number of users
- Enhance access and connections to ports, airports, transit stations or other intermodal facilities

GOAL 2: ***Provide a safe and secure transportation system.***

Objectives

- Improve safety for roadway users
- Address deficiencies on roadways to facilitate the movement of the military and citizens during emergency situations

GOAL 3: ***Retain and increase business and employment opportunities.***

Objectives

- Enhance the movement of goods throughout the Commonwealth
- Provide transportation investments in economically disadvantaged areas

GOAL 4: ***Improve quality of life and minimize the potential impacts to the environment.***

Objectives

- Minimize cultural and environmental impacts
- Minimize community impacts

GOAL 5: ***Preserve the existing transportation system and promote efficient system management.***

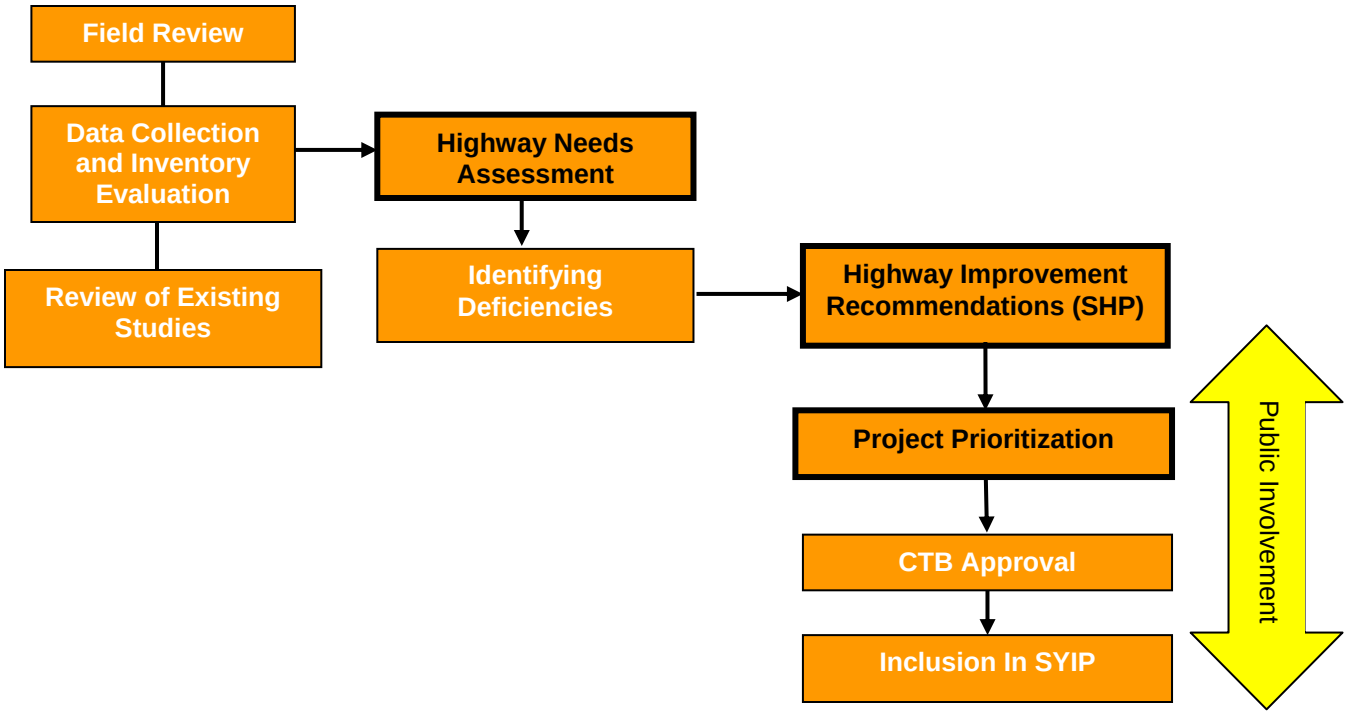
Objectives

- Encourage access management
- Reduce reliance on single occupant vehicles
- Minimize long-term maintenance costs
- Maximize the use of limited highway funding

State Highway Plan Development

Figure 2 below graphically illustrates the development of the 2025 SHP. The various components of the process are described in detail in the sections following.

FIGURE 2. STATE HIGHWAY PLAN DEVELOPMENT
(Bolded boxes indicate Statewide Planning Process phases)



Field Review

From 1999 to 2000, VDOT construction district planning and/or engineering personnel and Central Office Transportation and Mobility Planning Division (TMPD) planners participated in a field survey of all interstates and primary roads in each district (with the exception of Northern Virginia, where recommendations were derived from the *Northern Virginia 2020 Transportation Plan*). The field review resulted in a detailed list of deficient road conditions, noting the type of facility, number of through lanes, type and number of at-grade intersections, median type, shoulder type, access control, surface and pavement type, and speed limit. Preliminary recommendations for deficiency solutions were made during field reviews.

Data Collection and Inventory Evaluation

All data collection and analysis was performed on specific highway segments that were defined during the HNA and stored in the SPS. The HNA inventory was used as the base network inventory for the SHP. The planning analysis segments defined in the HNA process adhere to specific segment criteria guidelines defined in Figure 3 below. This allows for consistent statewide analysis sections, and provides logical termini for project descriptions.

The roadway inventory and traffic data from the SPS were used in the highway capacity analysis, in the total highway deficiency analysis, and in the establishment of highway improvement priorities in the SHP.

FIGURE 3. PLANNING LEVEL ROADWAY SEGMENT CRITERIA

The planning roadway inventory is comprised of:

- Interstate system
- US Highways and VA Primary Routes
- Intermodal connectors
- New roadways that are physically under construction

Criteria

- Segment breaks occur at functionally classified intersecting roads
- Segment breaks occur where there is a change in roadway functional classification
- Segment breaks occur where there are significant traffic volume changes
- Segment breaks occur where operation and capacity analysis type change
- Segment breaks occur at jurisdictional and urbanized area boundaries
- Segment breaks occur at grade separated interchanges, as well as changes in median type
- Segments are given the same mile points, route number, and nodes as VDOT's official Highway Traffic Records Inventory System (HTRIS) where applicable

Figure 4 provides an inventory of the interstate and primary lane miles by construction district. The lane mileage noted in Figure 4 represents the total lane mileage evaluated for the SHP.

FIGURE 4. INTERSTATE AND PRIMARY LANE MILEAGE BY DISTRICT

DISTRICT	INTERSTATE	PRIMARY	TOTAL
Bristol	520	2,898	3,418
Salem	490	2,605	3,095
Lynchburg	4*	2,682	2,686
Richmond	1,307	3,247	4,554
Hampton Roads	865	2,050	2,915
Fredericksburg	282	2,155	2,437
Culpeper	275	1,822	2,097
Staunton	941	2,418	3,359
Northern Virginia	673	1,507	2,180
STATE TOTAL	**5,357**	**21,384**	**26,741**

*Maintained by Culpeper District

Review of Existing Studies

Numerous planning studies completed between 1995 and 2000 were used to supplement recommendations development. Supplemental studies included corridor studies, Metropolitan Planning Organizations' long-range transportation plans, and small urban area transportation studies.

Corridor Studies

Corridor studies used for the development of the SHP include conceptual/feasibility studies, environmental impact statements, and major investment studies. These study recommendations typically focus on a highway corridor, providing design concepts and addressing right of way and environmental issues. The goal is to identify the mix of transportation improvements that will be most effective in moving people and goods, balancing those improvements with available funding as well as neighborhood and community concerns.

Metropolitan Planning Organizations' Long-Range Transportation Plans

Metropolitan areas designated by the U.S. Census with populations of 50,000 or more are required to develop long-range transportation plans. To the greatest extent possible, recommendations from these plans were incorporated into VDOT's SHP. However, the Metropolitan Planning Organization's (MPO) long-range transportation plans (CLRP) are required to be financially constrained, demonstrating that there is sufficient future funding to finance long-range plan recommendations. The SHP is a vision plan and not required to maintain financial constraint. Therefore, as a vision plan, the SHP can include all identified highway recommendations. Financial constraint will occur during the programming processes.

Where MPO transportation vision plans existed, their recommendations on the interstate and primary systems were incorporated. However, not all MPOs have an adopted vision plan. In the cases where a vision plan did not exist, VDOT developed recommendations within the MPO areas to address deficiencies that were not addressed by their CLRPs. These recommendations were not endorsed by the MPOs. This is important, since transportation projects within the MPO areas must be in the MPO constrained long-range plan and MPO transportation improvement program to receive federal funding.

Small Urban Area Studies

VDOT and small urban areas (cities and towns with populations less than 50,000) have developed vision plans to address transportation issues and identify travel needs for their communities through the year 2020. These plans analyze existing conditions within the urban areas, consider other modes of travel and freight movement, identify future transportation needs and coordinate local needs with state highway improvement plans. Where these studies identify improvements to the primary system, these recommendations will be incorporated into the SHP. The small urban area studies did not identify recommendations on the interstate highway system.

Highway Needs Assessment

An important element of the HNA is highway capacity analysis. The capacity analysis identified traffic congestion at the planning level for road segments. Once deficiencies were identified, the next step was to develop solutions, and express these as planning recommendations. VDOT was asked to accomplish this task in the most objective manner possible by both Joint Legislative Audit and Review Commission and the Auditor of Public Accounts. To meet the objectivity requirement, the 2025 Highway Needs Assessment (HNA) was developed. The HNA established a technical and objective method of identifying system-wide highway performance deficiencies, without regard to financial constraints, to assist policy and decision makers in determining future transportation funding needs and allocations. The HNA process provides documentation for the identified highway needs on the state-maintained highway systems at a statewide and VDOT construction district level. The HNA was developed using the Statewide Planning System (SPS), a database that contains an inventory of all interstate and primary roads in the state of Virginia. This inventory includes, but is not limited to pavement widths, number of lanes, traffic history, traffic projections, geometric characteristics, area type, and terrain type. Through SPS, a capacity analysis for the inventory, with derived capacity solutions, can be obtained. However, the HNA does not identify the need for new facilities on new alignments, nor does it consider system continuity to allow for logical transitions in the existing roadway network.

To maintain objectivity, no upper limit was placed on the capacity solutions (e.g.; there was no limit on the number of lanes that would be added to address a capacity deficiency). The capacity solutions identified in the HNA were used as a starting point for the development of planning recommendations on the interstate and primary highway systems in the SHP. Where previous study recommendations existed, they were used in the SHP.

Identifying Deficiencies

The capacity analysis of roadways is directly impacted by traffic volumes and forecasts, as well as roadway geometrics. Deficiencies on the interstate and primary highway systems were identified using highway capacity analysis. Once the assessment of previous studies and the field review were complete, highway capacity analysis was conducted. Highway capacity analysis was performed using present-day traffic volumes and traffic forecasts for all planning segments.

Where current traffic forecasts were unavailable, forecast volumes were developed using historic trends in traffic growth. When available, traffic projections from adopted long-range plans and from corridor studies were used to supplement the historic trend analysis. Traffic analysis from long-range transportation plans and corridor studies are typically based on travel demand models (which incorporate population, employment, and land use growth projections). The SHP uses a 20-year traffic forecast. The base year of this plan is 2005, thus, it has a forecast year of 2025.

All traffic volumes were updated to the most recently available traffic counts (2003/ 2004) maintained by VDOT's Traffic Engineering Division. Following the update, linear regression analysis was performed on the historic traffic counts to develop future traffic projections for all segments. The traffic projections were reviewed to detect and correct unreasonable increases or decreases in volume.

Roadway deficiencies were identified for interstates and primaries using the roadway inventory that was updated during the field review, and the traffic projections. Numerous characteristics from the roadway inventory were used to determine highway deficiencies.

Highway performance was described in terms of Level of Service (LOS). Thresholds for LOS were identified to provide an initial screen for deficiencies across the interstate and primary systems. Permitted LOS criteria were set at LOS C for rural areas, and LOS D for urban or urbanized areas. The LOS was calculated using the methods and procedures outlined in the Transportation Research Board's *Highway Capacity Manual 2000*. Figure 5 visually depicts the various levels of service defined in the *Highway Capacity Manual 2000*.

Highway deficiency analysis incorporates many factors, which vary depending on the location, type and function of the facility. For the interstate and primary systems, factors such as capacity flow-rates, geometrics, minimum pavement width, and speed were used to identify the highway deficiencies. Interstate and primary facilities comprise various types of facilities, which involve varying operational types, and varying analysis types. The type of facility, and associated deficiency criteria are noted in Figure 6.

The capacity flow-rates for the different LOS thresholds were developed using the latest available highway facility inventory (pavement width, number of lanes, free flow speed, etc.). This information was used in conjunction with present day traffic volumes and forecast traffic volume estimates to identify the LOS by planning level segment.

The geometric considerations were horizontal and vertical alignment, and the typical section (see Appendix C) of the highway. By necessity, the evaluation required a certain amount of professional judgment by the team responsible for the analysis.

For interstate and other controlled access multilane highway facilities, a pavement width of 12 feet per lane was the minimum acceptable pavement width, as defined by *VDOT Road and Bridge Specifications* standards. For two-lane primary facilities, 16 feet was the minimum acceptable pavement width. Regardless of traffic volumes, highways that did not meet the minimum pavement width standards were determined deficient.

FIGURE 5. LEVEL OF SERVICE (LOS) DEFINITIONS

Level of Service A: Free-flow traffic with individual users virtually unaffected by the presence of others in the traffic stream. The effects of disruptions, such as a vehicle entering from a ramp or an incident is easily absorbed at this level.

Level of Service D: High-density flow in which speed and freedom to maneuver are severely restricted and comfort and convenience have declined. Flow remains stable, however, is bordering on unstable.

Level of Service B: Stable traffic flow with a high degree of freedom to select speed and operating conditions but with some influence from other users.

Level of Service E: Unstable flow at or near capacity levels with poor levels of comfort and convenience. Virtually no visible gaps within traffic stream. Any disruption will cause traffic to slow or stop.

Level of Service C: Restricted flow which that remains stable but with significant interactions with others in the traffic stream. The general level of comfort and convenience declines noticeably at this level as additional vigilance is required for safe operation.

Level of Service F: Forced traffic flow in which the amount of traffic approaching a point exceeds the amount that can be served. LOS F is characterized by stop-and-go waves, poor travel times, low comfort and convenience, and increased accident exposure and is used to identify the point where the facility has reached maximum capacity and a complete breakdown of service occurs.

FIGURE 6. DEFICIENCY CRITERIA CONSIDERED BY HIGHWAY TYPE

Characteristics Considered	Controlled Access Highways	Multilane Rural Highways without Access Control	Two Lane Rural Highways	Urban/ Suburban Arterials
Number of Lanes	√	√		√
Speed	√	√	√	√
Density of Vehicles	√	√	√	√
Delay	√	√	√	√
Number of Vehicles	√	√	√	√
Terrain Type	√	√	√	√
Access Points		√	√	√
Pavement Width	√	√	√	√
Roadway Alignment		√	√	√
Interchange Spacing	√			
Number of Signals		√		√
Distance to Obstruction	√	√	√	√
Shoulder Width	√	√	√	√
Truck Percentage	√	√	√	√
Land Use Type	√	√	√	√
Crash Rate	√	√	√	√
Percent No Passing			√	
Median Type	√	√		√
Bridge Sufficiency	√	√	√	√

Based on the above criteria, a deficiency analysis was conducted statewide. Figure 7 shows the percentage of statewide lane miles considered deficient in 2004 and those projected to be deficient in 2025.

Using the LOS criteria for rural and urban area facilities, it is projected that by 2025, at least 96 percent of the interstate system lane miles in five of VDOT's nine construction districts (i.e., Bristol, Fredericksburg, Lynchburg, Northern Virginia, and Salem) will be deficient.

FIGURE 7. PERCENT OF STATEWIDE LANE MILES CONSIDERED DEFICIENT BY SYSTEM

SYSTEM	2004	2025
Interstate	29%	79%
Primary	32%	49%

Once deficiencies were defined at a statewide level using the established methodology and deficiency criteria, the development of recommendations for the interstate and primary highway systems commenced.

Highway Improvement Recommendations (SHP)

SHP recommendations were developed using *HCM 2000* analysis, *AASHTO Greenbook* guidelines, *VDOT Road and Bridge Specifications*, study and plan recommendations, and field analysis by VDOT personnel. Recommendations include increased pavement width, additional lanes, realignment of existing facilities, median improvements, high-occupancy vehicle lanes, collector-distributor roads and bridge improvements.

Recommendations from previous studies and long range transportation plans were used when applicable. In the case of recommendations for new facilities, the approximate location of the new alignment is shown on the highway plan maps only if the CTB has selected an official alignment. In cases where the CTB has not officially endorsed or selected an alignment, the improvement is shown on the existing deficient facility, and the need for a "corridor improvement" is noted.

SHP recommendations cover the interstate and primary highway systems, with suggested improvements for both existing roadways and new alignments. The SHP does not include recommendations for secondary and urban facilities since localities are primarily responsible for funding decisions on these systems. These recommendations will be developed at the local level.

For each recommendation, a corresponding planning level estimated cost is provided. Planning level cost estimates are calculated on a cost per mile basis, with the exception of estimated costs for bridge structures (calculated as cost per square foot) and interchanges (calculated as cost for structure). Planning cost estimates account for preliminary engineering, right of way (based on adjacent land use types), and construction costs (see Appendix D). It is important to note that planning cost estimates are to be used to determine an order of magnitude on planning level recommendations – **they are not actual design and construction costs**. Accurate cost estimates can only be achieved with a thorough project scoping that occurs during the preliminary engineering phase of actual project development.

A recommendations map for the interstate system can be found on the Secretary of Transportation's website (http://www.sotrans.state.va.us/VTrans/interstate.pdf). The interstate recommendations are listed by route and mapped statewide. The primary highway recommendations maps (http://www.virginiadot.org/projects/pr-statehighwayplan.asp) are grouped by VDOT construction district to facilitate the mapping of recommendations. The maps also include tables with descriptions of recommendations, which are listed by county, and then by route number.

Figure 9 illustrates the estimated investment needed on these systems by construction district to achieve acceptable performance levels. These figures are in thousands of 2002 dollars.

FIGURE 8. ESTIMATED COSTS* (IN 1000'S) OF RECOMMENDED IMPROVEMENTS BY VDOT CONSTRUCTION DISTRICT

DISTRICT	PRIMARY	INTERSTATE**	TOTAL
Bristol	2,356,000	70,108	2,580,057
Salem	1,550,500	1,490,028	3,029,168
Lynchburg	461,800	***	460,878
Richmond	2,257,600	1,067,400	3,231,266
Hampton Roads	2,223,283	6,390,700	7,410,379
Fredericksburg	1,805,230	1,650,000	4,536,563
Culpeper	1,480,866	65,000	1,542,038
Staunton	1,165,300	60,200	1,133,013
Northern Virginia	2,091,665	3,407,000	3,263,889
STATE TOTAL	**$15,392,244**	**$14,200,436**	**$29,592,680**

*Estimated costs are planning level costs (in 2002 dollars) and are subject to change.
**Interstate recommendations are not included for I-81, which currently is under study.
***Lynchburg District does not maintain any interstate facilities.

Public Outreach

The recommendations in this plan have had local government and public review. Public information meetings were held in each of the nine VDOT construction districts during the summer of 2004. State legislators, local government representatives and transportation stakeholders were invited to attend these meetings. Meeting notices were published in local newspapers and on the VDOT public website inviting the general public. These meetings provided the public with an opportunity to comment on the draft SHP recommendations for interstates and primaries.

The State Highway Plan public information meetings were held in conjunction with the VTrans2025 public information meetings. Each modal agency (Departments of Transportation, Aviation, Rail and Public Transportation and the Virginia Port Authority) presented their respective long-range plans at these meetings.

The meetings followed an open, informal format. Local officials were invited to attend a presentation prior to the general session, where they were briefed on the meeting's format and objectives. VDOT representatives were available to answer questions regarding the maps of district and statewide recommendations and comment on the handouts describing the purpose of the SHP and the recommendations descriptions.

Comment forms were distributed at the meetings and over 260 completed forms were returned. Follow-up post cards were mailed to those who supplied contact information to inform them of future public involvement opportunities.

Once the recommendations were prioritized, the candidate projects were once again made available for public review. VDOT conducted additional meetings in each construction district

in the fall of 2005, with transportation planners available to answer questions and address concerns regarding the highway recommendations and the process used to prioritize the SHP.

Project Prioritization

VDOT developed a prioritization process in response to two independent reports—one by the Auditor of Public Accounts (2002) and the other by the Joint Legislative Audit and Review Commission (2001). Both of these documents recommended that VDOT develop and apply a prioritization methodology at the planning level that would provide justification for project selection and programming. In 2002, the General Assembly passed HB 771, which required a plan to assess transportation needs statewide and assign priorities to projects.

The objective was to develop a simple and concise method to evaluate interstate and primary recommendations in the SHP for use in determining highway investment recommendations to provide to the Commonwealth Transportation Board (CTB). The prioritization methods of other state DOTs and MPOs across the nation were researched as part of this effort, with a particular focus on performance measures and scoring methodologies.

The development of the prioritization process was coordinated with the VTrans2025 effort to establish the goals and performance measures. An internal steering committee, comprised of district and central office personnel, was established to develop prioritization measures and a scoring methodology.

Prioritization criteria were determined based on data that was consistent and readily available, such as crash rate, level of service and volume to capacity ratio. The prioritization steering committee identified a number of future data needs that will make the prioritization process more robust. The process that was developed and will ultimately be used annually was designed to allow for maximum flexibility and future expansion. It is anticipated that the methodology will continue to evolve as additional data sources become available.

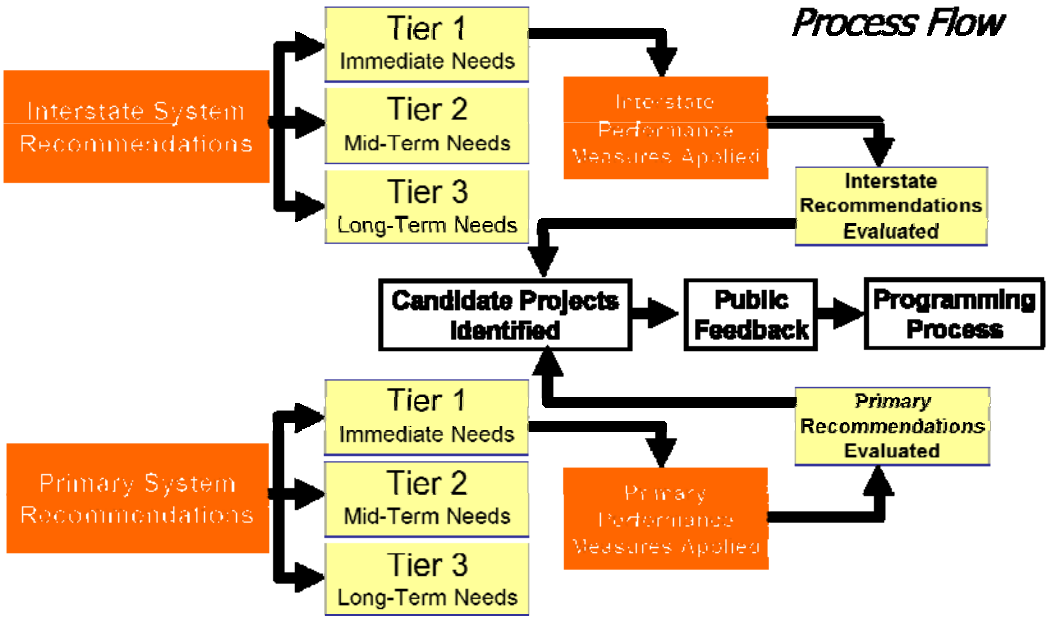
During the prioritization process, recommendations for improvements to the interstate and primary systems are categorized into three tiers: Tier 1-immediate (2005 – 2011), Tier 2-intermediate (2012 – 2020), and Tier 3-long-term (2021 and beyond) priorities. Tier 1 recommendations undergo extensive data collection and analysis to assist in the prioritization process. As illustrated in Figure 8, the established criteria are applied to the recommendations in Tier 1 only, examining the most pressing needs, which are then ranked by assigning values and scores.

The ranked Tier 1 interstate and primary system recommendations are reviewed and verified by VDOT district review teams comprised of the following individuals:

District Administrator
District Construction, Preliminary Engineering, and Maintenance Managers
Resident Engineers
District Planner
Central Office District Coordinator (Transportation and Mobility Planning Division)
Central Office Statewide Planning Section representative (Transportation and Mobility Planning Division)

Each district review team recommended one to three interstate system priorities, and five primary system priorities from Tier 1, which were presented to the CTB to consider for inclusion into the SYIP.

FIGURE 9. HIGHWAY PROJECT PRIORITIZATION PROCESS



Following the review of priorities by VDOT district staff and CTB members in the summer of 2005, public meetings were held in each VDOT construction district during the fall of 2005 to present the priorities identified as candidate projects for inclusion in the upcoming SYIP. The public comments received at these meetings, along with the technical analyses of the candidate projects, were presented to the CTB to assist the members in their decision-making process for the development of the SYIP.

It is important to note that the identification of a State Highway Plan recommendation as a priority does not guarantee that the recommendation will become a project in the SYIP. There are numerous factors receiving consideration prior to adoption of a recommendation into the SYIP. These factors include, but are not limited to: available funding, project viability (defined as ability for the project to move forward immediately), and public feedback.

Monitoring Process

The goal of the SHP was to identify interstate and primary highway improvement needs throughout the state regardless of the availability of funding. The SHP recommendations included capacity expansion, safety improvements and new alignments. Specific criteria, such as number of lanes, pavement width, number of vehicles and bridge sufficiency ratings were developed to support the need for improvements. Recommendations from existing plans were considered and an extensive field review was conducted.

Roadway conditions are not static. The number of vehicles a roadway carries can increase daily. Surrounding land uses change, increasing the burden on the existing facilities. Therefore, it is essential that the SHP be regularly monitored and updated to reflect changes in demographics, growth and travel patterns. Data needs to be continually updated and field reviews conducted at least every five years.

Limited financial and other resources allow only a small portion of the total needs to move forward as projects for consideration for inclusion in the SYIP. Therefore, the prioritization process focuses on identifying only the most critical needs. This will necessitate the development of strategies that can be employed to relieve the burden that continues to be placed on roadways that are not improved. These strategies include:

Access management – an approach for improving traffic operations by managing the location, design and operations of driveways, median openings, and street connections onto highways. Consolidating or eliminating access points can delay the need for adding new lanes or building new facilities, and in some cases, eliminate the need for improvement completely.

Travel Demand Management – a strategy that reduces traffic by influencing the manner in which people travel. For instance, encouraging people to carpool, use transit, telecommute or simply modify their work schedules to avoid peak commute times will greatly reduce the demand currently placed on facilities, especially during peak hours.

Intelligent Transportation Systems – technology that allows for more efficient use of existing facilities by providing the traveling public with information regarding their trip and traveling options in advance of their departure or encountering problems. Examples include construction or accident information, and real time congestion and weather reports.

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Glossary

Bridge Sufficiency Rating – A prioritization rating of bridges used to allocate funds. The rating varies from 0.0 (very poor) to 100.0 (very good). Structures having sufficiency ratings less than 80.0 are eligible for federal rehabilitation funds. Structures having a rating less than 50.0 are eligible for federal replacement funds.

Capacity— The maximum rate of flow at which persons or vehicles can be reasonably expected to traverse a point or uniform segment of a lane or roadway during a specified time period under prevailing roadway, traffic and control conditions. Capacity is usually expressed as vehicles per hour or persons per hour.

Commonwealth Transportation Board—A board appointed by the Governor with the responsibility to locate, construct, and maintain all state highways and to establish policy for the administration of all state highway systems.

Construction Districts—Nine geographical areas in which the state has been subdivided for purposes of construction fund distribution and administration of the highway construction and maintenance programs (see map in Appendix B).

Federal Functional Classification—The grouping of highways into systems according to the character of the service they are intended to provide.

Field Survey—a scan of actual roadway inventory and traffic conditions in the field conducted by VDOT personnel.

Geometrics—The vertical (i.e., grade) and horizontal (i.e., curve) alignment and physical characteristics (e.g., pavement width, shoulders, curb, gutter) of a highway.

Highway Capacity Manual 2000— Produced by the Transportation Research Board to provide data used for estimating capacity and determining level of service for transportation facilities.

Highway Needs Assessment – A repeatable comprehensive review of the performance of the highway system based on a system-generated objective analysis.

Highway Prioritization Methodology – A tool used to prioritize highway recommendations based on a set of performance measures.

Highway System—A state-designated classification of highways for funding allocation purposes. Includes interstate, primary, secondary, and urban systems.

Interstate – Highways that connect states and major cities.

Lane Miles—Represent a roadway's centerline mileage (measured through the center of a lane of pavement) multiplied by the number of lanes (e.g., a 1-mile segment of a two-lane road is 2 lane miles).

Level of Service (LOS)—A measure of operational conditions in the travel stream, described in terms such as speed and travel times, freedom to maneuver, traffic interruptions, comfort, convenience and safety.

Linear Regression—Linear regression analysis uses the "least squares" method to fit a line through a set of observations. One can analyze how a single dependent variable is affected by the values of one or more independent variables—for example, how traffic volumes are affected by a factor such as time. By a review of the growth of historical traffic data, future traffic volumes can be projected.

Intelligent Transportation Systems - Provides the technology that enables people to make smart travel choices.

Metropolitan Planning Organization (MPO)—An organization created under federal law representing the local governing bodies, local transit operators, and state and federal transportation agencies that is charged with the responsibility for carrying out a continuing, cooperative, and comprehensive "3C" transportation planning process in census-designated urbanized areas with population greater than 50,000. There are 14 MPO areas in Virginia.

National Highway System (NHS) - A 163,000 mile system of rural and urban roads throughout the United States designated by Federal legislation that serves major population centers, international border crossings, intermodal facilities, major travel destinations and terminals. It consists of the Interstate System, other urban and rural principal arterials, highways that provide access from the NHS to major intermodal transportation facilities, the Defense Strategic Highway Network (STRAHNET), and strategic highway connectors. There are 3,564 miles of highways in Virginia that are designated NHS.

Planning Cost Estimates – Cost estimates calculated on a cost per mile basis for roadways, cost per square foot for bridge structures and cost per structure for interchanges. These cost estimates are not intended to be actual project construction costs but are used to determine an order of magnitude on planning level recommendations.

Planning District – Geographic areas into which the state has been subdivided for the purposes of regional planning. There are 21 planning districts in Virginia.

Primary system – Roads that connect cities and towns with each other and with interstates. Primary roads serve the state in the same manner as the Interstate system serves the nation.

Project Cost Estimating System (PCES)— An accounting system used by VDOT that provides a method of obtaining accurate estimates for construction projects by gathering data on all foreseeable requirements of a project and combining those requirements with inflation-adjusted costs.

Right-of-Way—The total area of land required to accommodate a roadway, including travel lanes, shoulders, gutters, etc.

Rural Area—All of the geographic areas in the state that are outside of MPO and small urban area study boundaries.

Secondary System – A system of local connector or county roads that serves inter-regional and localized traffic.

Service Volume—The maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of lane or roadway during a given period.

Six Year Improvement Program—A six-year capital improvement program of all highway and transit construction projects and project staging statewide for the interstate, primary, secondary, and urban systems.

Small Urban Area—Urban areas with a population between 2,500 and 50,000. There are 49 small urban areas in Virginia.

Statewide Highway Planning System (SHiPS)—A data system used by VDOT to store and report transportation planning related data and information, developed in the late 1980's and early 1990's.

Statewide Planning System (SPS)— A data system used by VDOT designed to organize transportation planning related data and information such as roadway inventory, capacity analysis and traffic projections. This model analyzes the data, evaluates system deficiencies and provides highway improvement recommendations. The SPS then uses planning cost estimates to provide costs for the proposed recommendations.

Traffic Monitoring System (TMS)—A monitoring system used by VDOT to provide incident, congestion and present day traffic volume information on select segments of roadways.

Transportation Research Board (TRB)— A division of the National Research Council which is supported by state transportation departments, the various administrations of the U.S. Department of Transportation and other federal agencies, industry associations, and other organizations and individuals interested in transportation to stimulate research and facilitate the sharing of information on transportation practice and policy by researchers and practitioners.

Typical Section—The footprint of the physical characteristics of an urban or rural roadway (pavement width, number of lanes, shoulder type, median type, etc.).

Urbanized Area – A U.S. Census designated geographical urban area that has a population of 50,000 or more.

List of Acronyms

CLRP – Constrained Long Range Plan

CTB – Commonwealth Transportation Board

HNA – Highway Needs Assessment

HTRIS - Highway Traffic Records Inventory System

LOS – Level of Service

MPO – Metropolitan Planning Organization

PCES - Project Cost Estimating System

PDC – Planning District Commission

SHP – State Highway Plan

SPS – Statewide Planning System

SYIP – Six Year Improvement Program

TMPD – Virginia Department of Transportation's Transportation and Mobility Planning Division

TMS – Traffic Monitoring System

TRB – Transportation Research Board

VDOT – Virginia Department of Transportation

VMT – Vehicle Miles Traveled

APPENDICES

Appendix A

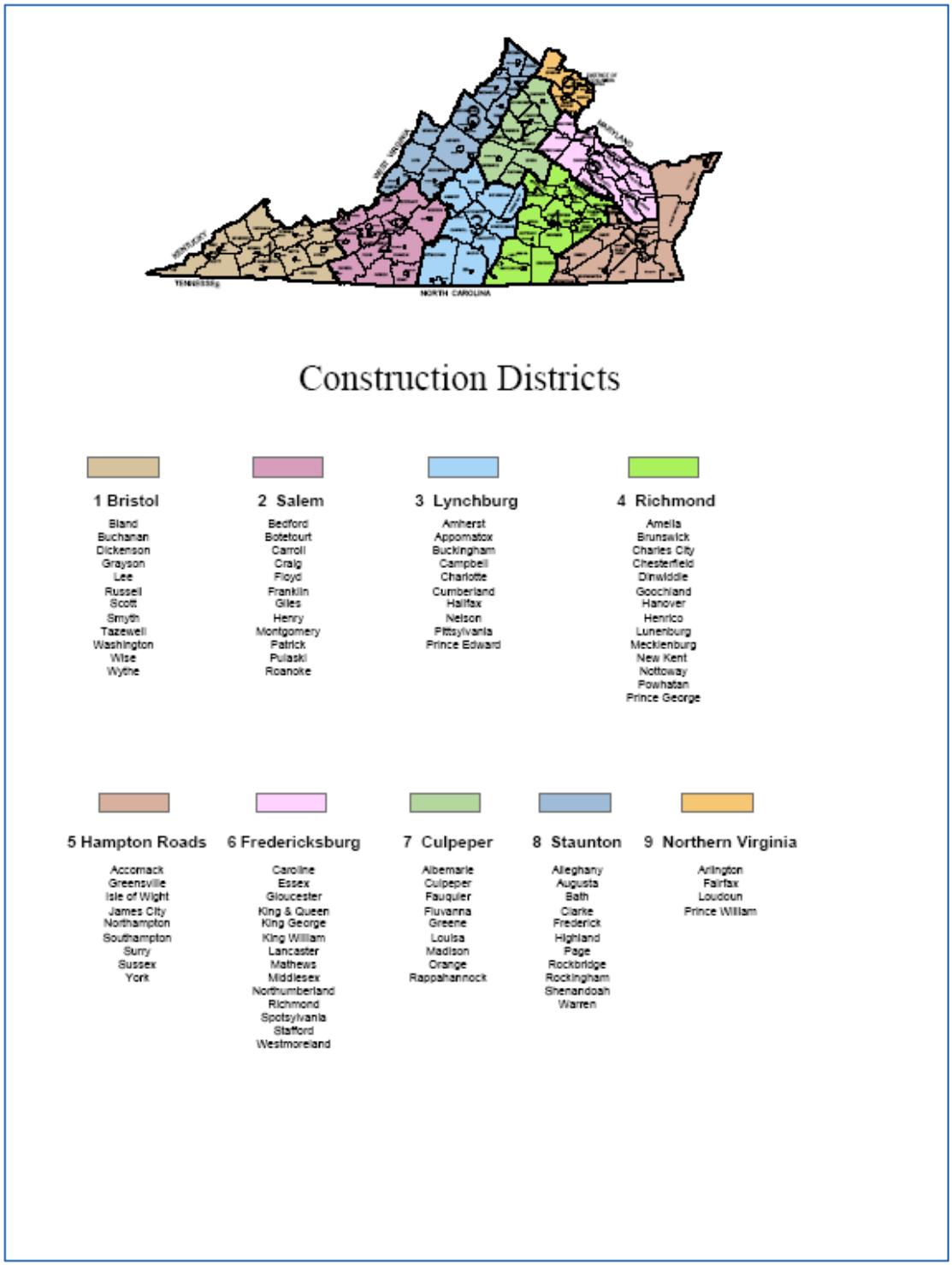
SMALL URBAN AREAS

Urban Area	County	Planning District	VDOT Construction District
Abingdon	Washington	Mount Rogers	Bristol
Altavista	Campbell	Central	Lynchburg
Bedford	Bedford	Central	Salem
Big Stone Gap	Wise	Lenowisco	Bristol
Blacksburg	Montgomery	New River	Salem
Blackstone	Nottaway	Piedmont	Richmond
Bluefield	Tazewell	Cumberland Plateau	Bristol
Buena Vista	Rockbridge	Central Shenandoah	Staunton
Chase City	Mecklenburg	Southside	Richmond
Chincoteague	Accomack	Accomack-Northampton	Suffolk
Christiansburg	Montgomery	New River	Salem
Clifton Forge	Alleghany	Fifth	Staunton
Covington	Alleghany	Fifth	Staunton
Culpeper	Culpeper	Rappahannock Rapidan	Culpeper
Elkton	Rockingham	Central Shenandoah	Staunton
Emporia	Greensville	Crater	Suffolk
Farmville	Prince Edward	Piedmont	Lynchburg
Franklin	Southampton	Hampton Roads	Suffolk
Front Royal	Warren	Northern Shenandoah	Staunton
Galax	Carroll	Mount Rogers	Salem
Grottoes	Rockingham	Central Shenandoah	Staunton
Harrisonburg	Rockingham	Central Shenandoah	Staunton
Lebanon	Russell	Cumberland Plateau	Bristol
Lexington	Rockbridge	Central Shenandoah	Staunton
Luray	Page	Northern Shenandoah	Staunton
Marion	Smyth	Mount Rogers	Bristol
Martinsville	Henry	West Piedmont	Salem
Narrows	Giles	New River	Salem
Norton	Wise	Lenowisco	Bristol
Orange	Orange	Rappahannock Rapidan	Culpeper
Pearisburg	Giles	New River	Salem
Pulaski	Pulaski	New River	Salem
Radford	Montgomery	New River	Salem
Richlands	Tazewell	Cumberland Plateau	Bristol
Rocky Mount	Franklin	West Piedmont	Salem
Saltville	Smyth	Mount Rogers	Bristol
South Boston	Halifax	Southside	Lynchburg
South Hill	Lunenburg	Southside	Richmond
Staunton	Augusta	Central Shenandoah	Staunton
Strasburg	Shenandoah	Northern Shenandoah	Staunton
Stuart	Patrick	West Piedmont	Salem

Urban Area	County	Planning District	VDOT Construction District
Tazewell	Tazewell	Cumberland Plateau	Bristol
Warrenton	Fauquier	Rappahannock Rapidan	Culpeper
Waynesboro	Augusta	Central Shenandoah	Staunton
Wise	Wise	Lenowisco	Bristol
Woodstock	Shenandoah	Northern Shenandoah	Staunton
Wytheville	Wythe	Mount Rogers	Bristol

Appendix B

VIRGINIA DEPARTMENT OF TRANSPORTATION CONSTRUCTION DISTRICTS



Appendix C

TYPICAL ROADWAY SECTIONS

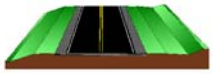
KEY TO TYPICAL SECTIONS

U - Urban Roadways with Curb and Gutter

R - Rural Roadways with Standard Shoulders and Ditches

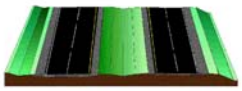
D - Divided Roadways

Note: Typical section dimensions shown may be modified during actual implementation to suit traffic demand and field conditions. Recommended typical roadway sections will require additional study relative to lane width, median width or type, and right-of-way requirements. Right-of way widths range from a minimum of 50' along some primary roadways to 250' or greater along freeways/ expressways. All interstate facility recommendations will include limited access features and, where appropriate, other features such as high occupancy vehicle and/or collector-distributor lanes. Some primary facility recommendations will warrant limited access right-of-way.



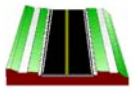
R2

2 denotes number of through lanes
roadway width range: 20' - 24'
right-of-way width range: 50' - 130'



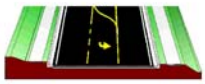
R4D
R6D
R8D

4/6/8 denotes number of 12' through lanes, both directions
median width range: narrow-barrier type; 16' - 28' raised type, or variable width depressed type
right-of-way width range: 100' - 250'



U2

2 denotes number of through lanes
roadway width range: 36' - 44' curb to curb
right-of-way width range: 50' - 70'

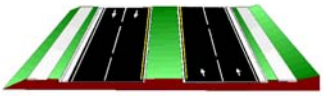


U3

2 through lanes with center turn lane
roadway width range: 40' - 48' curb to curb
right-of-way width range: 60' - 70'

U4

4 denotes number of through lanes
roadway width range: 48' - 64' curb to curb
right-of-way width range: 70' - 90'



U4D
U6D
U8D

4/6/8 denotes number of 12' through lanes, both directions
median width range: narrow-barrier type; 16' - 28' raised type, or variable width depressed type
right-of-way width range: 90' - 150'

Appendix D

Statewide Planning Cost Estimates

Costs Reflected as of January 2002

Costs include 20% for engineering and contingencies

# Lanes	Urban Typical Section	Pavement Width	Cost per mile
2 Lanes	U2	26'-30'	2,200,000
3 Lanes	U3	36'-40'	4,200,000
4 Lanes	U4D	40'-48'	5,000,000
4 Lanes Divided	U4D	48' w/ 16' raised median	5,600,000
4 Lanes Divided	U4D	48' w/ 28' raised median	6,000,000
6 Lanes Divided	U6D	72' w/16' raised median	7,200,000
6 Lanes Divided	U6D	72' w/ 28' raised median	7,800,000
8 Lanes Divided	U8D	96' w/ 16' raised median	9,000,000
8 Lanes Divided	U8D	96' w/ 28' raised median	9,500,000
# Lanes	**Rural Typical Section**	**Pavement Width**	**Cost**
1 Lane		12'	242,000
2 Lanes	R2	18'	368,000
2 Lanes	R2	20'	609,000
2 Lanes	R2	22'	725,000
2 Lanes	R2	24'	1,050,000
3 Lanes	R3	36'	2,100,000
4 Lanes Divided	R4D	48' w/ 28' raised median	2,835,000
4 Lanes Divided	R4D	48' w/ 16' raised median	3,045,000
4 Lanes Divided	R4D	48' w/ 28' raised median	3,570,000
6 Lanes Divided	R6D	72' widen 4 to 6 lanes	3,990,000
6 Lanes Divided	R6D	72' w/ depressed median	5,250,000
8 Lanes Divided	R8D	96' widen 6 to 8 lanes	3,990,000
8 Lanes Divided	R8D	96' widen 4 to 8 lanes	7,875,000